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FATTENING STEERS ON SUMMER PASTURE IN THE SOUTH.

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THE experiments described in this bulletin required several years for completion, but in view of present opportunities for live stock in the South and efforts to reduce production costs, the results are of unusual current interest. The bulletin treats each experiment separately as follows:

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PURPOSE OF WORK AND PREVIOUS EXPERIMENTS.

The producer of beef in the South depends largely on pasture for growing and finishing his cattle for market. A great variety of valuable pasture plants is found. Some of the plants make rapid growth early in the spring; others flourish later in the heat of summer; still others furnish abundant grazing in the fall. Coupled with these conditions is the smaller proportion of tillable land in the South than is found in the corn-belt States; that fact makes the area left for grazing proportionately more extensive. For these reasons sound information on the proper use of southern pasture lands for beef production is of more than average importance.

The first of a series of experiments in fattening steers on grass, conducted jointly by the Bureau of Animal Industry and the Alabama Experiment Station, was begun in 1908 and continued during each grazing period until 1913, inclusive. In 1915 similar work was commenced in Mississippi cooperatively with the Mississippi Experiment Station. Results of summer feeding to and including 1911, together with other experiments in wintering and dry-lot feeding of beef cattle, have been published.[1]

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[1] Acknowledgment is due G. A. Scott and S. W. Greene, of the Animal Husbandry Division, United States Department of Agriculture, for assistance in compiling this bulletin.

This bulletin is confined to reports of four summers' feeding—two in Alabama in 1912 and 1913 and two in Mississippi in 1915 and 1916. Each year's test is reported separately.

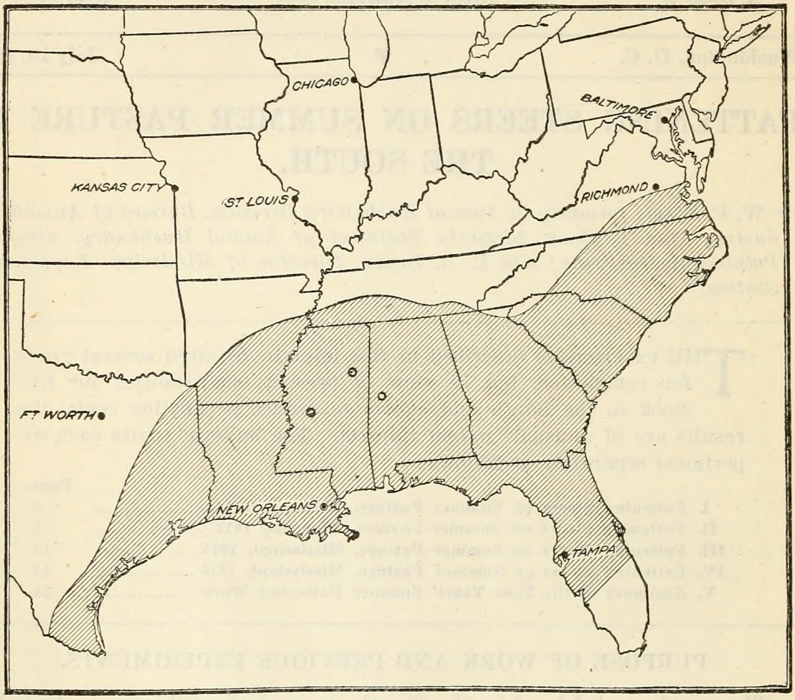

FIG. 1.—The shaded area represents the portion of the Southern States to which the results obtained in the feeding experiment are applicable. The unshaded portions within the shaded area represent coastal plain and piney-wood sections where soil and pasture conditions are different from those applicable to the experiment. The circles in Alabama and Mississippi show the approximate locations of the test farms. The locations of the various cattle markets to which southern cattle are shipped is also shown.

All tests were carried out under actual and typical farm conditions; consequently the results may be applied directly to the management and feeding of cattle on pasture in southern regions where climatic conditions and pasture grasses are similar to those of Sumter County, Ala., and Clay and Madison Counties, Miss., which will be described.

The experiments of 1912 and 1913 were conducted on the farm of O. E. Cobb, Sumterville, Sumter County, Ala., where several years' experimental work with beef cattle already had been done. The cattle, feed, and pastures were furnished by Mr. Cobb. The bureau employed S. S. Jordan to have direct charge of the management and feeding and to keep records of the work.

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[1] See Bureau of Animal Industry Bulletins 103, 147, and 159, and Department of Agriculture Bulletins 73, 110, 761, and 762.

I. FATTENING STEERS ON SUMMER PASTURE. ALABAMA, 1912.

OBJECTS AND PLAN OF THE EXPERIMENT.

The general plan of the work was similar to that followed in previous years. Usually the steers were purchased in the fall, carried through the winter, divided into lots in the spring, and put on pasture as soon as the grasses were well started. In this experiment most of the steers were purchased late in the spring and put on pasture late in May, with the intention of finishing them for market early in the fall.

The 90 steers available were divided and fed as follows:

Lot 1, 29 steers, pasture alone.
Lot 2, 25 steers, pasture and one-half corn chop and one-half cottonseed cake.
Lot 3, 36 steers, pasture and cottonseed cake.

The lots were purposely unequal in number to conform to the size of pasture used.

The objects of the experiment were (1) to continue the study of fattening steers on pasture; (2) to determine whether it is profitable to feed cottonseed cake to cattle on pasture; (3) to compare cottonseed cake with a ration of one-half cottonseed cake and one-half corn chop for finishing steers on pasture; and (4) to see which of the three methods is most profitable.

The steers of the three lots were chiefly grade Herefords, Shorthorns, and Aberdeen-Angus. A few were grade Red Polls. All were 2 and 3 year olds of fair quality.

CHARACTER AND PRICES OF FEEDS USED.

The cottonseed cake used in this test was nut size and of good quality, containing about 38 per cent crude protein. The advantages of feeding cake instead of meal are these: Rains do not make the cake unpalatable and winds do not blow it out of the feed bunks; the cake requires chewing, and greedy steers can not eat more than their share at the expense of the timid ones. When cottonseed meal is fed in open pastures, rain and wind are liable to cause waste; greedy steers bolt it and often get scours, which causes the animals to feed out unevenly.

The corn was shipped in and part of it was badly damaged. That fact must be considered when comparing the gains of the steers in lot 2 with those of the other lots. The cottonseed cake cost $28 a ton on the farm. The corn chop was charged to the steers of lot 2 at an average price of 85½ cents a bushel.

The character of the pasture lands and grasses is described in Department of Agriculture Bulletin 110, entitled "Fattening Cattle in Alabama," from which the following is quoted:

> The summer pastures used in these experiments consisted of a mixture of sweet clover (melilotus), Japan clover (lespedeza), Johnson grass, crab grass, and some Bermuda grass. The sweet-clover seed had been planted, but the other plants were purely voluntary. As a rule sweet clover becomes available for light grazing by March 15, while the Japan clover and Bermuda grass seldom afford good grazing before May 15.

Rains and showers were frequent throughout the summer, and abundant grazing was furnished by the pastures until September, when it became very dry. The pastures were charged to the steers at 50 cents a head for each period of 28 days.

METHOD OF FEEDING AND HANDLING THE CATTLE.

The three lots of steers were put on pasture May 28, 1912. The pastures had not been used for a month and were in fine condition. The steers were weighed at the beginning of the work and again at the end. As some of them were extremely wild, the former practice of weighing every 28 days was discontinued.

Lots 1 and 2 were supplied with good artesian water, while lot 3 had water only from pools in the pasture. All the cattle were salted once a week. The cattle of lot 1 had little attention other than salting. Lot 2 was fed once a day, about sundown, cottonseed cake and corn chop, and lot 3 was fed cottonseed cake in troughs placed in the pasture. The cattle went on feed well, and came up for their feed with little trouble.

All steers were dipped four times during the progress of the experiment to insure freedom from ticks.

RESULTS OF THE EXPERIMENT.

A summary of this test is shown in Table 1.

TABLE 1.—*Results of summer steer feeding in Alabama, 1912.*

Item.	Lot 1.	Lot 2.	Lot 3.
	Pasture alone.	Pasture and one-half corn chop and one-half cottonseed cake.	Pasture and cottonseed cake.
Number of steers	29	25	36
Days of feeding period	112	106	101
Average daily ration per head:			
Cottonseed cake ... pounds	....	1.75	3.56
Corn chop ... do	....	1.75	....
Cost of feed per 100 pounds gain	$1.71	$5.14	$5.32
Cost per head to feed through summer	$2.00	$7.36	$6.88
Initial cost of steers ... per 100 pounds	$3.87	$3.87	$3.87
Selling price of steers ... do	$4.00	$4.75	$4.75
Average profit per steer	$3.47	$4.69	$4.61
Per cent dressed	48.68	51.91	51.62
Average initial weight ... pounds	646	601	611
Average final (market) weight per head ... do	763	744	740
Average total gain per head ... do	117	143	129
Average daily gain per head ... do	1.04	1.35	1.28

DAILY RATIONS.

When the steers were started on pasture, May 28, each steer of lot 2 received 2.5 pounds of cake and corn mixture daily, and practically the same quantity of cake alone was fed to each steer of lot 3. These moderate allowances were gradually increased until July 13, after which a full feed of 4 pounds of the concentrates was given daily per head until the end of the experiment.

When it is recalled that some of the corn fed to lot 2 was damaged, and that previous experiments had shown that 100 pounds of cottonseed cake usually produce as much gain on steers as 200 pounds of corn, it was to be expected that the steers of lot 3 would make the best gains.

WEIGHTS AND GAINS.

The steers were shipped about 50 miles to market, and the shrinkage was estimated at 3 per cent, thus making the actual daily gain of the steers in all lots somewhat larger than those shown in the table.

Comparison of the relative daily gains shows that lots 2 and 3 made more rapid gains than lot 1, as would be expected. The steers fed a ration of corn chop and cottonseed cake gained faster than those fed cottonseed cake along with the pasture.

The cost of producing 100 pounds increase in live weight in the different lots is much in favor of lot 1. With pasture charged at 50 cents a head for each 28 days, 100 pounds gain in lot 1 cost only $1.71. The average cost of 100 pounds gain in lots 2 and 3 was $5.14 and $5.32, respectively. Thus cheap pasture made the cost of gains lowest for the steers of lot 1, while the more rapid gains of lot 2 were produced 18 cents more cheaply per 100 pounds than those of lot 3, although lot 3 received slightly cheaper feed than lot 2.

SLAUGHTER DATA.

The steers were sold to butchers at Meridian, Miss., about 50 miles from the farm. The dressing percentages show that the steers of lots 2 and 3, which were fed cake and corn, dressed out approximately 3 per cent higher than those getting pasture only, which indicates the higher finish on the cake-and-corn-fed steers. The higher selling price received for these cattle justified the extra cost of the feeds, as will be seen in the financial statement.

TABLE 2.—*Slaughter data.*

Lot No.	Number of steers.	Market weight per head.	Average weight of carcass.	Per cent dressed.
		Pounds.	*Pounds.*	
1	29	763	371	48.65
2	25	744	386	51.38
3	36	740	382	51.62

FINANCIAL STATEMENT.

All the steers cost $3.87 a hundredweight, but those of lot 1, which had pasture alone, sold for 75 cents less per hundredweight than those of the other two lots. The average profits on the steers of lots 1, 2, and 3 were $3.47, $4.69, and $4.61 per head, respectively. While a very small margin was realized on the steers, all returned a profit. The more rapid gains made by the steers of lot 2 account for the slightly greater profit this lot gave over lot 3, while the low rate of gains and the comparatively poor finish of those of lot 1 accounts for the smaller profits they returned. A feeder must not be misled by the high cost of gains alone, as the higher price paid for extra finish on steers often more than compensates for the added cost of feeding relatively high-priced feeds.

RELATIVE VALUE OF MANURE.

Another feature, which does not appear in the results tabulated, is the beneficial effect of the manure on the pasture. The manure from cattle fed cottonseed cake or meal is richer in nitrogen than that from steers fed on pasture only. For example, the steers of lot 3 consumed 13,054 pounds of cottonseed cake containing approximately 800 pounds of nitrogen, practically all of which is returned to the pasture as manure. This nitrogen, valued at 20 cents a pound, is worth $160. If we add the value of the phosphoric acid at 4 cents a pound and the potash at 5 cents a pound, we have a total of about $185.

Thus pastures grazed by steers fed high-protein feeds, such as cottonseed cake and meal or cotton seed, receive the benefit of the fertilizing elements the feeds contain, and consequently become more fertile from year to year.

TABLE 3.—*Financial statement.*

Lot 1, fed pasture alone:	
To 29 steers, 18,745 pounds, at $3.875 a hundredweight	$726.36
To pasture charges, 112 days at 50 cents a head for 28 days	58.00
Total expenditure	784.36
By sale of 29 steers, 22,122 pounds, at $4.00 a hundredweight	884.88
Total profit	100.52
Average profit per head	3.47
Lot 2, fed pasture with one-half cottonseed cake and one-half corn chop:	
To 25 steers, 15,014 pounds, at $3.875 a hundredweight	581.79
To pasture charges, 106 days at 50 cents a head for 28 days	47.50
To 4,662 pounds cottonseed cake at $28.00 a ton	65.27
To 4,662 pounds corn at 85½ cents a bushel	71.20
Total expenditure	765.76
By sale of 25 steers, 18,592 pounds, at $4.75 a hundredweight	883.12
Total profit	117.36
Average profit per head	4.69

Lot 3, fed pasture with cottonseed cake:	
To 36 steers, 22,000 pounds, at $3.87 a hundredweight	$852.50
To pasture charges, 101 days at 50 cents a head for 28 days	64.90
To 13,054 pounds cottonseed cake, at $28.00 a ton	182.76
Total expenditure	1,100.16
By sale of 36 steers, 26,654 pounds, at $4.75 a hundredweight	1,266.06
Total profit	165.90
Average profit per head	4.61

SUMMARY OF ALABAMA EXPERIMENT, 1912.

1. The objects of this test were, (1) to determine whether it is profitable to fatten cattle on summer pasture in Alabama; (2) to compare the results of fattening on pasture alone and on pasture supplemented with cottonseed cake and a combination of cottonseed cake and corn chop; and (3) to compare the relative value, for fattening cattle on pasture, of a combination of cottonseed cake and corn chop with that of cottonseed cake alone.

2. Ninety grade cattle of the beef breeds were used in three lots and fed as follows: Lot 1, 29 head, pasture alone; lot 2, 25 head, pasture and a mixture of one-half cottonseed cake and one-half corn chop; lot 3, 36 head, pasture and cottonseed cake.

3. Besides the pasture the average daily ration per head was 1.75 pounds each of cottonseed cake and corn chop for the steers of lot 2, and 3.56 pounds of cottonseed cake for those of lot 3.

4. The average daily gains per head, using the market weights as the final weights, were 1.04 pounds, 1.35 pounds, and 1.28 pounds for lots 1, 2, and 3, respectively.

5. To produce 100 pounds of gain it cost $1.71 for the steers of lot 1, $5.14 for lot 2, and $5.32 for lot 3.

6. The cattle of lots 2 and 3 dressed out practically the same, 51.91 per cent and 51.62 per cent, respectively. The steers of lot 1, fed on pasture alone, dressed out only 48.68 per cent.

7. The market price received for the steers of lot 1 was 75 cents a hundredweight less than for those of the other lots. The average profits per head were $3.47 for lot 1, $4.69 for lot 2, and $4.61 for lot 3.

II. FATTENING STEERS ON SUMMER PASTURE, ALABAMA, 1913.

OBJECTS AND PLAN OF THE WORK.

The experiment conducted during the summer pasture season of 1913 was essentially a duplicate of the previous year's test except that in the ration of lot 2 corn-and-cob meal was substituted for corn chop. Three lots of steers were carried on pasture from spring until early in the fall, when they were marketed. The 77 head used were divided into three lots and placed on pasture April 8, where they were fed as follows until September 2, when they were sold:

Lot 1, 26 steers, pasture alone.

Lot 2, 25 steers, pasture with one-half cottonseed cake and one-half corn-and-cob meal.

Lot 3, 26 steers, pasture and cottonseed cake.

DESCRIPTION OF CATTLE USED.

The steers used were mostly 3-year-olds, with a few 2-year-olds that had been wintered on the Cobb farm. All were in thrifty condition April 8, 1913, when initial weights were taken. Most of the cattle were grade Aberdeen-Angus, Herefords, and Shorthorns, though a few showed Jersey blood. In general the steers were typical of those raised in Alabama at the time of the experiment.

CHARACTER AND PRICES OF FEEDS USED.

The cottonseed cake and meal were of good quality, containing about 38.6 per cent crude protein, and cost $27.50 a ton at the farm. Late in July the supply of cottonseed cake was exhausted and cottonseed meal was used to finish the steers.

The corn, which was fed as corn-and-cob meal, was sound and good. The entire ears and the husks were ground together and charged against the steers at 70 cents a bushel.

CONDITION OF PASTURES.

The same pastures were used as in the 1912 experiment, but all of them furnished better grazing. The pasture of lot 1 had more sweet clovers. The only water in the pasture of lot 3 was that in ditches and pools; lots 1 and 2 had both well water and ditch water. Except for a short, dry period early in May, rains were quite frequent, and the steers had an abundance of grass throughout the summer. Pasture was charged at 50 cents a head for each 28-day period.

METHOD OF FEEDING AND HANDLING.

Each day, about sundown, the steers in lots 2 and 3 were fed in troughs in the open pasture. Initial and final weights of every animal were taken and each lot was weighed at the end of each 28-day period. All were dipped in an arsenical dip five times during the experiment, to keep them free from ticks. Salt was provided once a week.

RESULTS OF THE EXPERIMENT.

Table 4 shows the chief features of the experiment.

TABLE 4.—*Results of summer steer feeding in Alabama, 1913.*

Item.	Lot 1.	Lot 2.	Lot 3.
	Pasture alone.	Pasture and one-half corn-and-cob meal and one-half cottonseed cake.	Pasture and cottonseed cake.
Number of steers	26	25	26
Days of feeding period	147	147	147
Average daily ration per head:			
Cottonseed cake ... pounds	....	1.79	3.70
Corn-and-cob meal ... do	....	1.76	....
Cost of pasture and feed for 100 pounds gain	$1.09	$3.51	$3.27
Cost per head to feed through summer	$2.62	$9.71	$10.12
Initial cost of steers per 100 pounds	$5.25	$5.25	$5.25
Selling price of steers per 100 pounds	$5.00	$6.00	$6.00
Average profit per head	$6.60	$8.27	$11.23
Average initial weight per head ... pounds	610	588	593
Average final (farm) weight per head ... do	850	840	902
Average total gain per head ... do	240	252	309
Average daily gain per head ... do	1.63	1.71	2.10

DAILY RATION.

The steers had been fed cake lightly for about 5 weeks before the test. Lots 2 and 3 were given, therefore, 3 pounds of concentrates per head at the beginning, and the quantity was gradually increased until on May 10 the steers of lot 2 were eating daily 2 pounds of cottonseed cake and 2 pounds of corn-and-cob meal per head, and those of lot 3 were each eating 4 pounds of cottonseed cake daily. These quantities were fed daily until the end of the experiment, September 2.

COMPARATIVE GAINS.

Lot 1 made an average daily gain of 1.63 pounds a head, a very satisfactory result for such steers.

Lot 2 gained 1.71 pounds per head daily. While this gain was greater than that of the steers in lot 1, it is less than would be expected from the feeding method used.

Lot 3, having cottonseed cake in addition to pasture, made very good gains for that class of steers. From the standpoint of producing rapid gains, the results indicate that cottonseed cake alone as a supplement to pasture is greatly superior to the half-and-half mixture of cottonseed cake and corn-and-cob meal fed to the steers in lot 2.

COST OF GAINS.

The cost of gains was lower than in the previous year, attributable to the more rapid gains made in 1913 and the slightly cheaper feeds.

The pasture, charged at 50 cents a head for each 28-day period, cost $2.62 per steer throughout the 147-day period. This, of course, was the entire feed charge against the steers of lot 1. It cost $9.71 a head to pasture and feed the steers of lot 2, and $10.12 a head for those of lot 3. The rapid gains of the steers in lot 3, however, made the cost of gains lower than those of lot 2, although the latter were getting cheaper feed.

The steers were sold by farm weights less 3 per cent shrinkage, and were shipped to Meridian, Miss., for slaughter. All were not shipped at the close of the experiment, so that the slaughter records were not obtained.

FINANCIAL STATEMENT.

The value of the steers at the beginning of the experiment was $5.25 a hundredweight. Those of lot 1, which had pasture only, sold for $5 a hundredweight in the fall, but even in the face of such a handicap made a profit of $6.60 a head. This remarkable showing is due entirely to the good gains which the steers made on cheap pastures. The steers in the other two lots were fed the supplemental ration to advantage, since they sold for $6 a hundredweight, which was $1 more than the lot 1 price. The relative profits indicate that it pays to feed cottonseed cake to steers on pasture, but the substitution of corn-and-cob meal, which costs but a few dollars a ton less than cottonseed cake, for one-half the cake, is not so profitable as feeding cake alone.

The value of manure from the steers of lots 2 and 3 also must be considered.

The important results agree with those obtained the previous year and again high costs of gain, due to the additional feed of cake and corn, were more than paid for by the higher selling price of the better-finished steers in lots 2 and 3.

TABLE 5.—*Financial statement.*

Lot 1, fed pasture alone:	
To 26 steers, 15,854 pounds, at $5.25 a hundredweight	$832.33
To pasture charges at 50 cents a head for 28 days	68.25
Total expenditure	900.58
By sale of 26 steers, 21,447 pounds, at $5 a hundredweight	1,072.35
Total profit	171.77
Average profit per steer	6.60

Lot 2, fed pasture and half cottonseed cake and half corn-and-cob meal:	
To 25 steers, 14,705 pounds, at $5.25 a hundredweight	$772.01
To 6,611 pounds cottonseed cake at $27.50 a ton	90.90
To 8,637 pounds ear corn at 70 cents a bushel	86.37
To pasture charges at 50 cents a head for 28 days	65.63
Total expenditure	1,014.91
By sale of 25 steers, 20,361 pounds, at $6 a hundredweight	1,221.66
Total profit	206.75
Average profit per head	8.27

Lot 3, fed pasture and cottonseed cake:	
To 26 steers, 15,418 pounds, at $5.25 a hundredweight	809.44
To 14,171 pounds cottonseed cake at $27.50 a ton	194.85
To pasture charges at 50 cents a head for 28 days	68.25
Total expenditure	1,072.54
By sale of 26 steers, 22,741 pounds, at $6 a hundredweight	1,364.46
Total profit	291.92
Average profit per head	11.23

SUMMARY OF ALABAMA EXPERIMENT, 1913.

1. The objects and general plan for the test were similar to those for the previous year. The 3 lots were on feed 147 days.

2. The steers used were 2 and 3 year old grades, 77 head in all, carrying a large percentage of the blood of beef breeds. They were divided and fed as follows: Lot 1, 26 head, pasture only; lot 2, 25 head, pasture and one-half cottonseed cake and one-half corn-and-cob meal; lot 3, 26 head, pasture and cottonseed cake.

3. The average daily ration of concentrates was 3.55 pounds of the half-and-half mixture of cottonseed cake and corn-and-cob meal per head for the steers of lot 2, and 3.70 pounds of cottonseed cake for those of lot 3.

4. The average daily gains were 1.63 pounds a head for the steers of lot 1, 1.71 pounds for lot 2, and 2.10 pounds for lot 3.

5. The cost of feed and pasture to produce 100 pounds of gain was $1.09, $3.51, and $3.27 for lots 1, 2, and 3, respectively.

6. The finished cattle of lots 2 and 3, which were fed supplements in addition to the pasture, sold for $1 a hundredweight more than those of lot 1.

7. The cake-fed steers returned a profit of $11.23 a head, the cake-and-corn-fed steers $8.27 a head, and those pastured without other feed made a profit of $6.60 a head.

III. FATTENING STEERS ON SUMMER PASTURE, MISSISSIPPI, 1915.

The cooperative experiments in fattening cattle on pastures in the South were discontinued in Alabama after the test of 1913 and transferred to Mississippi, where the work was continued in cooperation with the Mississippi Experiment Station. The present experiment was conducted on the farm of Ben Walker at Abbott, Clay County, Miss., who furnished the cattle, feeds, and pastures.

The soil and pasture grasses are very similar to those of Sumter County, Ala., where the previous work was conducted. Clay County, Miss., is in the so-called black-prairie section, the soils of which carry a good supply of lime, and produce alfalfa, clovers, grasses, and forage crops in abundance. The land, however, is less rolling than that in Sumter County, Ala. N. F. Hansen was employed by the bureau to take personal charge of the cattle in the experiments and to keep records of the work.

OBJECTS AND PLAN OF THE WORK.

The objects of this test were to obtain additional information and data concerning the fattening of steers on summer pasture in the South. The same general plan was followed as in the Alabama experiments. The steers were placed on pasture in the spring and fattened for early fall market. Owing to the high price of corn at Abbott in the spring of 1915 only two lots were used.

Forty steers were divided into 2 lots of 20 each and fed as follows: Lot 1, 20 steers, pasture alone; lot 2, 20 steers, pasture and cottonseed cake.

DESCRIPTION OF CATTLE USED.

The 40 steers in this experiment were ordinary natives of mixed and inferior breeding. Jersey blood predominated in all but a few, which showed evidences of Angus and Shorthorn blood. They had been wintered on cottonseed meal, cottonseed hulls, and corn silage, and were in good condition when the experiment began, averaging 678 pounds.

CHARACTER AND PRICES OF FEEDS USED.

The cottonseed cake which was fed to the steers of lot 2 was of high quality, analyzing 43 per cent crude protein, and cost $29.60 a ton delivered at the farm.

The pastures were practically equal in size and in the area of grazing furnished for each lot. The grasses making up these pastures are much the same as those found in the Alabama pastures previously described. Lespedeza, Bermuda grass, and crab grass are the most important ones.

Owing to a dry period early in the spring of 1915 the pastures were not ready for use until late in May, and in midsummer a drought of two months' duration almost ruined the pastures for the season. Rains during the latter part of August also injured them somewhat. Owing to these unsatisfactory conditions good gains on the cattle could hardly be expected. The pasture was charged at the rate of 50 cents a head for each period of 28 days, as in the Alabama tests.

METHOD OF FEEDING AND HANDLING THE CATTLE.

The cottonseed cake was fed each evening about sundown in troughs placed in the pasture. Pools in the open pastures furnished the only source of water supply for the steers, and became very low and foul during the extended dry period. Salt was provided each week.

Individual weights of all the steers were taken at the beginning and at the end of the experiment, and each lot was weighed every 28 days. As the cattle were free from ticks, no dipping was done.

RESULTS OF THE EXPERIMENT.

Table 6 gives in brief the general features and results of the experiment.

TABLE 6.—*Results of summer steer feeding in Mississippi, 1915.*

Item.	Lot 1.	Lot 2.
	Pasture alone.	Pasture and cottonseed cake.
Number of steers	20	20
Days of feeding period	107	107
Average daily ration per head:		
Cottonseed cake ... pounds		3.65
Cost of feed and pasture per 100 pounds gain	$1.06	$3.44
Cost per head to feed through summer	$1.91	$7.37
Initial cost of steers per 100 pounds	$5.00	$5.00
Selling price of steers per 100 pounds	$5.75	$6.35
Average profit per steer	$7.19	$9.61
Per cent dressed	(1)	50.8
Average initial weight per head ... pounds	678	678
Average final weight per head ... do	858	892
Average total gain per head ... do	180	214
Average daily gain per head ... do	1.68	2.00

[1] Lot 1 sold as stockers.

DAILY RATIONS.

The average daily ration of cottonseed cake for the steers of lot 2 was 3.65 pounds each. They were given 2 pounds a head daily at the beginning, which was gradually increased during the first month to 4 pounds. This allowance was continued until the end of the experiment.

WEIGHTS AND GAINS.

The steers were equally divided so that the average weight in both lots was 678 pounds. The average total gain was 180 pounds for the steers of lot 1 and 214 pounds for those of lot 2. The average daily gain was 1.68 pounds for the steers of lot 1 and 2 pounds for those of lot 2. Considering the kind of steers and the dry season, these gains were very good. As would be expected, the cake-fed steers made the better gains, each steer putting on an average of 34 pounds more than those getting pasture alone.

COST OF GAINS.

The gains for lot 2 cost more than three times as much as those for lot 1. Each 100 pounds of gain for the steers of lot 1 cost only $1.06, while the same gains for lot 2 cost $3.44, but on account of the higher selling price the profit on lot 2 was greater. These figures are about the same as for the summer test of 1913 in Alabama.

SLAUGHTER DATA.

The steers were sold on the St. Louis market. Those of lot 1 were sold as stockers, and data on shrinkage were not obtained. For lot 2 the average final farm weight was 892 pounds, the average market weight was 847 pounds, and the net shrinkage in transit was 45 pounds a head. The steers dressed out 50.8 per cent of the market weights, which was satisfactory for that class of steers.

FINANCIAL STATEMENT.

The financial statement shows results similar to those of the steers fed in Alabama in 1912 and 1913. The steers fed cake on pasture brought the higher price again and made the greater profit. The initial cost per hundred pounds was $5 for all the steers, those of lot 1 sold as stockers for $5.75 a hundred pounds, and those of lot 2 brought $6.35 as finished beeves. The average profit for lot 1 was $7.19 a head, and $9.61 for lot 2, which was satisfactory for both lots.

TABLE 7.—*Financial statement.*

Lot 1, fed pasture alone:	
To 20 steers, 13,557 pounds, at $5 a hundredweight	$677.85
To pasture, 107 days at 50 cents per steer per 28 days	38.20
To freight, commission, yardage, etc	57.92
Total cost	773.97
By sale of 20 steers, 15,960 pounds, at $5.75 a hundredweight	917.70
Total profit	143.73
Average profit per steer	7.19

Lot 2, fed pasture and cottonseed cake:	
To 20 steers, 13,551 pounds, at $5 a hundredweight	$677.55
To pasture, 107 days at 50 cents per steer per 28 days	38.20
To cottonseed cake, 7,380 pounds, at $29.60 a ton	109.22
To freight, commission, yardage, etc	57.92
Total cost	882.89
By sale of 20 steers, 16,930 pounds, at $6.35 a hundredweight	1,075.05
Total profit	192.16
Average profit per steer	9.61

As in the work of 1912 and 1913, the cost of gains was much higher for the steers which received cake in addition to their pasture, but the higher finish which the cake-fed steers took on, and the consequent higher selling price, more than compensated for the increased cost of feeding the cake, as the profits show. The increased value of the manure from the cake-fed steers also should be taken into consideration.

SUMMARY OF THE EXPERIMENT.

1. The objects of this test were to continue the study of fattening mature steers on pasture in the South, including the use of cottonseed cake with pasture.

2. The cattle used were ordinary native cattle of mixed breeding. There were 40 head, which were divided into 2 lots equal in quality and weight and fed as follows: Lot 1, 20 head, pasture alone; lot 2, 20 head, pasture and cottonseed cake. The steers were put on pasture May 20 and fed until September 5, or 107 days in all.

3. The steers of lot 2 ate an average daily feed of 3.65 pounds of cottonseed cake.

4. Lot 1 made an average daily gain of 1.68 pounds per head; lot 2 gained 2 pounds per head daily.

5. To produce 100 pounds of gain, it cost $1.06 for the steers of lot 1, and $3.44 for those of lot 2.

6. The steers of lot 1, which had no other feed than pasture, were not finished, and were sold as stockers for $5.75 a hundredweight, while those of lot 2, which were fed cottonseed cake with the pasture, sold for $6.35 a hundredweight for the block.

7. Lot 1 made a profit of $7.19 a head, compared with $9.61 a head for lot 2.

IV. FATTENING STEERS ON SUMMER PASTURE, MISSISSIPPI, 1916.

The series of experiements in fattening steers on summer pasture was continued in the summer of 1916 in cooperation with the Mississippi Experiment Station on the Canton Stock Farm, near Canton, Madison County, Miss. The stock, feed, pastures, and equipment were furnished by the farm. The bureau placed S. S. Jerdan on the farm to supervise the feeding of the cattle and keep records of the test.

OBJECTS AND PLAN OF THE EXPERIMENT.

The experiment had for its chief object a further study of the fattening of steers on summer pasture, emphasizing especially the comparison of pasture alone and pasture supplemented with cottonseed cake. The test was planned along the same lines as the previous ones.

Corn was not to be had at reasonable prices, so only two lots of 30 steers each were used, one lot getting pasture alone, the other cottonseed cake in addition to the pasture.

CATTLE USED.

The stock used in this test were inferior mature steers of nondescript breeding, weighing from 550 pounds to 1,000 pounds each when the experiment began. Evidences of Jersey breeding were most prominent, while a few showed marks of Shorthorn, Hereford, Aberdeen-Angus, Red Polled, and Devon breeding. As a whole they were typical scrub steers of the South, and very few were good feeders. All but 15, which were raised on the farm, had been bought in Madison County early in May. They were divided into 2 lots of 30 each, as equally as possible in regard to size, condition, and quality. Madison County is in tick-free territory, and as no ticks were on the animals dipping was unnecessary.

CHARACTER AND PRICES OF FEEDS USED.

The cottonseed cake was of good quality, cracked to nut size, and analysis showed about 39 per cent crude protein. The steers ate it with relish. It cost $32 a ton in Canton, the cost of hauling it to the farm not being added.

The pastures were quite similar to those described in the work in Sumter County, Ala., and at Abbott, Miss. This region is in what is called the "brown-loam" classification, and the soil is very fertile, producing a great variety of grasses and clovers. The principal plants which furnished grazing were lespedeza, Paspalum, Bermuda grass, white clover, and some crab grass. No stock had been on the pastures before the experiment began, so that an abundance of grass and clover was available for the cattle throughout the experiment.

Heavy rains sometimes caused water to stand on parts of both pastures, and the grass was considered too "washy" to produce the best gains on the cattle. Parts of the pastures were clipped with a mower late in July, causing some improvement.

The two lots of steers were interchanged from one pasture to the other, so that discrepancies due to a difference in pastures might be avoided. Pasture was charged at the rate of 50 cents a head for a 28-day period.

METHOD OF FEEDING AND HANDLING THE CATTLE.

The steers of lot 2 were fed their cake in troughs in the pasture about sundown each day. They came up well for their feed, and relished it. Water was obtained from ditches and pools in the pastures. Individual weights of all steers were taken at the beginning and at the close of the test, and each lot was weighed at the end of each 28-day period while the experiment was in progress.

RESULTS OF THE EXPERIMENT.

The main features and results of the test are shown in Table 8, in which the two lots are compared with respect to rate of gains, cost of gains, profits, etc.

TABLE 8.—*Results of summer steer feeding in Mississippi, 1916.*

Item.	Lot 1.	Lot 2.
	Pasture alone.	Pasture and cotton seed cake.
Number of steers	30	30
Days of feeding period	134	134
Average daily ration per head:		
Cottonseed cake ... pounds		4.32
Cost of pasture and feed for 100 pounds gain	$1.12	$4.54
Cost per head to feed through summer	$2.39	$11.67
Initial cost of steers per 100 pounds	$5.50	$5.50
Selling price of steers per 100 pounds	$5.85	$6.10
Average profit per head	$5.88	[1] $0.05
Average initial weight per head ... pounds	662	664
Average final weight per head ... do	876	921
Average total gain per head ... do	214	257
Average daily gain per head ... do	1.60	1.92

[1] A loss.

DAILY RATIONS.

Lot 1 had only pasture. Cottonseed cake was fed to lot 2 at the rate of 2 pounds a head daily for the first few days. This was increased gradually during the first 3 periods, until on August 1 the average daily allowance per head was 5 pounds, which quantity was fed until the steers were marketed. The average daily ration of cake for the 134 days was 4.32 pounds a head.

WEIGHTS AND GAINS.

The average weight of the steers of lot 1 was 662 pounds when the experiment began, and they gained a total of 214 pounds a head, which was a daily gain of 1.6 pounds. For the grade of steers used these gains were fairly satisfactory.

The average initial weight of the steers of lot 2 was 664 pounds a head, and the final weight 921 pounds, showing a total gain of 257 pounds a head, equal to an average daily gain of 1.92 pounds for the period of 134 days. As would be expected, they gained more rapidly than those of lot 1, but better steers would have made larger gains.

COST OF GAINS.

The cost of gains for the steers getting pasture alone was low, as in previous tests, but the gains of those fed cottonseed cake on pasture cost more in this experiment than in 1913 and 1915, due principally to the higher cost and more liberal use of the cake.

The cost of feed per head through the summer was $2.39 for lot 1 and $11.67 for lot 2.

SLAUGHTER DATA.

The steers were taken off the experiment on September 28, driven to Canton on September 29, shipped to the St. Louis market, and slaughtered. After the steers had taken their " fill " at the market and were weighed, it was found that those of lot 1 had lost an average of 57 pounds, while those of lot 2 had lost 79 pounds. This wide variation in shrinkage between the 2 lots can not be accounted for. The conclusion that cake-fed steers shrink more in transit than grass-fed cattle is not supported by the results of many other shipments of steers.

The per cent of dressing was 51.17 for the steers of lot 1 and 54.21 for those of lot 2, which indicates the superior finish of the cake-fed steers. The latter were much better covered with fat than those of lot 1.

TABLE 9.—*Shipping and slaughter data.*

Item.	Lot 1.	Lot 2.
Number of steers	30	30
Average final farm weight per head ... pounds	876	921
Average market weight per head ... do	819	842
Average shrinkage in transit per head ... do	57	79
Average weight of carcass ... do	419	457
Per cent dressed	51.17	54.21

FINANCIAL STATEMENT.

The following statement shows the cost of steers, cost of feeds and marketing, and the receipts at the markets for each of the two lots. It is seen that the steers of lot 1 returned a net profit of $5.88 a head, while those of lot 2 showed a loss of 5 cents a head.

Of the four years' work this lot of steers which had cake with pasture is the only one which did not make a profit. Several things are responsible for this fact. The steers were sold on a small margin of 60 cents a hundred pounds, which is low for steers fed concentrates; the higher cost of the cottonseed cake also made the feeding more expensive than in former years. The steers used in the test were scrubs of very common breeding and poor quality, which accounts in a degree for the smaller margin of profit obtained. The steers used in previous tests were grade beef steers somewhat above the average of the State in quality and breeding. This indicates the desirability of having well-bred steers of high quality when expensive feeds are to be used. In addition to the disadvantages mentioned, the steers of lot 2 suffered a heavy shrinkage in transit to market in comparison with those of lot 1, which materially reduced the receipts.

Some credit also should be given to the steers of lot 2 for the added fertilizing value of their manure, because of the cottonseed cake which they had. Finally, it should be noted that a greater margin than is shown for these two lots of steers can usually be realized on cattle bought in the spring and marketed early in the fall, as these cattle were.

TABLE 10.—*Financial statement.*

Lot 1, fed pasture alone:	
To 30 steers, 19,865 pounds, at $5.50 a hundredweight	$1,092.58
To pasture, 134 days at 50 cents per 28 days	71.78
To freight charges to market $70, commission $15	85.00
To feed in transit and in yards $6, yardage $5.85, insurance 22 cents	12.07
Total expenditure	1,261.43
By sale of 30 steers, 24,580 pounds, at $5.85 a hundredweight	1,437.93
Total profit	176.50
Average profit per steer	5.88
Lot 2, fed pasture and cottonseed cake:	
To 30 steers, 19,922 pounds, at $5.50 a hundredweight	1,095.71
To pasture, 134 days at 50 cents per head per 28 days	71.78
To 17,400 pounds cottonseed cake at $32 a ton	278.40
To freight charges to market $70, commission $15	85.00
To feed in transit and in yards $6, yardage $5.85, insurance 23 cents	12.08
Total expenditure	1,542.97
By sale of 30 steers, 25,270 pounds, at $6.10 a hundredweight	1,541.47
Total loss	1.50
Average loss per steer	.05

SUMMARY OF THE EXPERIMENT.

1. The objects sought and the general plan pursued in this experiment were identical with those reported in the first three parts of

this bulletin. Two lots of 30 steers each were used, one lot having pasture alone and the other cottonseed cake with the pasture.

2. The cattle were inferior stock of mixed breeding, Jersey blood predominating.
3. The average daily ration of the cake-fed steers was 4.32 pounds a head.
4. The average daily gains per head were 1.6 pounds for the steers of lot 1, and 1.92 pounds for those of lot 2.
5. The cost of feed and pasture to produce 100 pounds of gain was $1.12 for the steers on pasture alone and $4.54 for those fed cake with the pasture.
6. The shrinkage in transit to market was 57 pounds and 79 pounds, respectively, per head for the steers of lots 1 and 2. No explanation can be made for so great a difference in shrinkage.
7. The dressing per cent for lot 1 was 51.17 and 54.21 per cent for lot 2, indicating superior finish on the cake-fed steers.
8. The scrub steers of this test failed to realize a profit when fed a high-priced supplementary feed, whereas the grade beef steers used in previous tests invariably returned good profits.

V. SUMMARY OF THE FOUR YEARS' SUMMER FATTENING EXPERIMENTS.

The more important data of the four years' summer fattening work are shown in condensed form by Table 11. This permits a direct comparison to be made of the results from the different methods used.

Comparing the averages of the three methods of fattening the steers, it will be noted that there was little difference in the average length of feeding and pasture periods. The average daily gains per head, which may be considered the most valuable standard in judging the efficiency of rations, were 1.49 pounds for the steers getting pasture only, 1.83 pounds for the steers getting cottonseed cake with pasture, and 1.53 pounds for those whose pastures were supplemented with the mixture of cake and corn chop.

The initial cost of the steers per 100 pounds of the three groups was the same for any one year, but in each case the steers of group I (pasture alone) sold for a lower price. The margins realized between the buying and selling prices of the cattle were always in favor of those which were fed supplements with their pastures. The margins averaged 24½ cents a hundredweight for the steers of group I, 90 cents for group II, and 81½ cents for group III.

While the data on the dressing per cent are not complete, inspection of the results given will show that the steers which were fed cottonseed cake or a mixture of cake and corn with pasture dressed out higher than the cattle which had pasture alone.

The steers of group I, which had pasture only, returned an average profit of $5.78 a head, against $6.23 for the cake-fed steers, and $6.48 for those on cake and corn. The average profit made on the cake-fed steers is adversely affected by the small loss on the lot fed in 1916. This poor result was caused by a combination of unfortunate conditions and the use of scrub steers.

TABLE 11.—*Summary of four years' summer fattening work.*

Group, ration, and year.	Number of steers.	Days fed.	Average total gain per head.	Average daily gain per head.	Cost of feed per 100 pounds gain.	Cost of cattle per 100 pounds.	Selling price per 100 pounds.	Margin per 100 pounds.	Dressing per cent.	Average profit per head.
I. Pasture alone:			*Lbs.*	*Lbs.*					*Per ct.*	
1912	29	112	117	1.04	$1.71	$3.87	$4.00	$0.13	48.68	$3.47
1913	26	147	240	1.63	1.09	5.25	5.00	[1] .25	....	6.60
1915	20	107	180	1.68	1.06	5.00	5.75	.75	....	7.19
1916	30	134	214	1.60	1.12	5.50	5.85	.35	51.17	5.88
Average	....	125	188	1.49	1.25	4.90	5.15	.245	49.92	5.78

[1] A loss.

TABLE 11.—*Summary of four years' summer fattening work*—Continued.

Group, ration, and year.	Number of steers.	Days fed.	Average total gain per head.	Average daily gain per head.	Cost of feed per 100 pounds gain.	Cost of cattle per 100 pounds.	Selling price per 100 pounds.	Margin per 100 pounds.	Dressing per cent.	Average profit per head.
II. Pasture and cottonseed cake:			*Lbs.*	*Lbs.*					*Per ct.*	
1912	36	101	129	1.28	$5.32	$3.87	$4.75	$0.88	51.62	$4.61
1913	26	147	309	2.10	3.27	5.25	6.00	.75	......	11.23
1915	20	107	214	2.00	3.44	5.00	6.35	1.35	50.80	9.61
1916	30	134	257	1.92	4.54	5.50	6.10	.60	54.21	[1].05
Average	......	122	227	1.83	4.14	4.90	5 80	90	52.21	6 23
III. Pasture with half cottonseed cake and one-half corn chop:[2]										
1912	25	106	143	1 35	5 14	3 87	4.75	.88	51.91	4.69
1913	25	147	252	1.71	3.51	5.25	6.00	.75	......	8.27
Average	......	126	198	1.53	4.32	4.56	5.37	.815	51.91	6.48

[1] A loss.

[2] Corn-and-cob meal fed in 1913.

The figures shown in Table 11 afford material for profitable study by farmers and feeders. It is seen that the steers in group I made gains very cheaply, but the total gains were not large and the steers did not take on a high finish. Their unfinished condition is reflected in the small margin on which they were sold and the low dressing percentages. Thus the profits they returned were smaller than for the steers of the other two groups.

The steers under group II made more rapid gains than the grass-fed cattle, but their gains cost more. However, they were better finished, as shown by the dressing percentages, and sold on the market for a higher price per hundredweight, which paid for the relatively expensive gains and returned a greater profit per head than was realized on the cattle in group I.

Since only two lots of steers were fed under group III, and because corn chop was fed to one and corn-and-cob meal to the other, the average results do not have the same weight as those of the first two groups. As they stand, the data show that the substitution of corn pound for pound for one-half of the cottonseed-cake allowance lowered slightly the rate of gains and increased the cost of gains. The steers of this group, however, gained more rapidly, finished in better condition, and brought higher prices and a larger profit per head than those of group I.

While the average profit per head for group III is greater than for the other two groups, a comparison of the profits of group II and III for 1912 and 1913 shows that the steers of group II returned the larger net profit per head for those two years.

CONCLUSIONS.

The methods of handling and feeding cattle are greatly affected by the constant variations in the prices of different feeds, by seasonal conditions, and by the changes in the live-stock markets. The following conclusions may be drawn from the experimental work reported in this bulletin:

1. Feeding cottonseed cake to steers as a supplement to summer pasture in the South increases materially the rate of gains made by steers, causes them to finish more quickly, and to take on a higher degree of finish.

2. Because of their better finished condition cake-fed steers bring higher prices on the markets than grass cattle. The margin or "spread" between buying and selling prices of steers fattened on pasture is nearly always increased by supplementing the pasture with cottonseed cake, or cake and corn.

3. Steers of inferior quality may return more profit by grazing alone than by grazing with the addition of supplementary feeds, especially when they are on good pastures that are cheap.

4. The cost of gains of steers on pasture is greatly increased by feeding cottonseed cake, but the better market price received for cake-fed cattle usually pays for the added cost of feeding the cake and returns a greater average profit than is realized on grass-fed cattle.

5. The substitution of corn chop for one-half the quantity of cottonseed cake for steers on pasture produces gains and finish comparable to those made by cake alone, but unless corn is available at a lower cost than the cake its use for this purpose is not recommended.

6. A half-and-half mixture of cottonseed cake and corn-and-cob meal for steers on grass is less efficient for producing gains than cottonseed cake alone or corn and cake. When corn is cheap its use shelled or as corn chop with cottonseed cake is preferable to corn-and-cob meal.

7. Pasture lands grazed by steers that are fed cottonseed meal or cake receive the benefit of large quantities of fertilizing elements through the manure of the cattle. The landowner should consider this feature when fattening cattle on pasture.

8. One of the distinct advantages in supplementing pastures with concentrates is the fact that steers so handled are finished more quickly and can be marketed earlier than steers getting grass alone. Thus the cattle can be sold before the rush of grass-fed cattle gluts the market and depresses prices. Moreover, when cattle are marketed early the pastures have time to recuperate and furnish good grazing for other stock during the fall.

9. Scrub steers do not respond readily to the use of good feeds, and even when well finished do not command satisfactory prices in competition with well-bred cattle similarly finished. On the other hand, good grade or pure-bred beef cattle make better use of their feeds, finish more rapidly, and always bring more on the market than scrub cattle of the same weight. The better the quality of the steers the safer it is to feed them high-priced feeds.

10. For a farmer who has roughages such as silage, hay, straw, stover, cottonseed hulls, or stalk feeds, and contemplates fattening steers on summer pasture, it is usually better to purchase the steers in the fall, and winter them on the roughages and a little cottonseed meal than it is to purchase them in the spring for fattening during the grazing season.

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